

CLAIM AMENDMENTS

This listing of claims will replace all prior versions, and listings, of claims in the application.

1 1. (Currently Amended) A method of determining placement of components in a rack  
2 comprising the steps of:  
3 providing input variables comprising a rack height, an identification of a set of  
4 components, a weight and a height for each component in the set of components;  
5 determining a placement of the components in the rack according to constraints  
6 by solving an optimization problem using a computer, the optimization problem using  
7 the rack height, the identification of the set of components, the height and weight for  
8 each component and the constraints; and  
9 evaluating the placement of the components according to ~~an~~ at least one objective  
10 comprising at least a center of gravity objective.

1 2. (Previously Presented) The method of claim 1 wherein the constraints comprise:  
2 a rack height constraint which requires that placement of a particular component  
3 does not result in a top height of the particular component exceeding the rack height;  
4 a single placement constraint which requires that each component be placed once  
5 and only once; and  
6 a non-overlapping constraint which requires that each slot in the rack be occupied  
7 by no more than a single component.

1 3. (Original) The method of claim 2 wherein the constraints further comprise a height  
2 preference constraint which prefers that a first component be placed above a second  
3 component.

1 4. (Previously Presented) The method of claim 1 wherein the step of determining  
2 placement of the components according to the constraints finds that at least one of the  
3 constraints cannot be met and further comprising the steps of:

4           relaxing a particular constraint; and  
5           determining placement of the components according to remaining constraints.

1    5. (Original) The method of claim 4 wherein the step of relaxing the particular  
2    constraint comprises providing a choice of relaxation constraints to a user and the user  
3    selecting the particular constraint from the choice of relaxation constraints.

1    6. (Currently Amended) The method of claim 1 further comprising the step of providing  
2    ~~a weight~~ and a weight distribution for each component in the set of components.

1    7. (Currently Amended) The method of claim 1[[6]] wherein the step of evaluating the  
2    placement of the components in the rack according to the objective comprises seeking a  
3    minimum height for ~~the~~ a center of gravity.

1    8. (Currently Amended) The method of claim 1[[6]] wherein the step of evaluating the  
2    placement of the components in the rack according to the objective comprises ensuring  
3    that a height of the center of gravity does not exceed a selected height.

1    9. (Original) The method of claim 1 further comprising the step of providing a  
2    placement height range for a particular component, wherein the placement height range  
3    comprises a minimum height and a maximum height.

1    10. (Original) The method of claim 9 wherein the placement height range is increased,  
2    thereby forming an increase in the placement height range, and further wherein a penalty  
3    is applied to the objective according to the increase in the placement height range.

1    11. (Original) The method of claim 1 further comprising the step of providing an empty  
2    space requirement for a particular component.

1 12. (Original) The method of claim 11 wherein the empty space requirement is selected  
2 from the group consisting of an empty space requirement above the particular component  
3 and an empty space component below the particular component.

1 13. (Original) The method of claim 11 wherein the empty space requirement is relaxed,  
2 thereby forming a relaxation of the empty space requirement, and further wherein a  
3 penalty is applied to the objective according to the relaxation of the empty space  
4 requirement.

1 14. (Original) The method of claim 1 wherein the steps of determining and evaluating  
2 the placement of the components comprise the step of employing a mixed integer  
3 programming technique.

1 15. (Original) The method of claim 14 wherein the step of employing the mixed integer  
2 programming technique employs a heuristic approach.

1 16. (Original) The method of claim 1 further comprising a contiguous placement  
2 constraint for at least two of the components within the set of components.

1 17. (Original) The method of claim 16 wherein the step of determining the placement of  
2 the components in the rack according to the constraints comprises forming a virtual  
3 component from the at least two components according to the contiguous placement  
4 constraint and further wherein remaining constraints determine placement of the virtual  
5 component.

1 18. (Original) The method of claim 1 further comprising the step of evaluating the  
2 placement of the components according to a second objective.

1 19. (Original) The method of claim 1 further comprising the step of evaluating the  
2 placement of the components according to additional objectives.

1 20. (Original) The method of claim 1 wherein the constraints comprise hard constraints.

1 21. (Original) The method of claim 1 wherein the objective comprises a soft constraint.

1 22. (Original) The method of claim 1 wherein the objective comprises a sum of soft  
2 constraints.

1 23. (Previously Presented) A method of determining placement of components in a rack  
2 comprising the steps of:

3 providing a rack height, an identification of a set of components, and, for each  
4 component in the set of components, a height, a weight, and a weight distribution;  
5 determining a placement of the components in the rack according to constraints  
6 by solving an optimization problem using a computer, the optimization problem using  
7 the rack height, the identification of the set of components, the height, weight and  
8 weight distribution for each component and the constraints, wherein the constraints  
9 comprise:

10 a rack height constraint which requires that placement of a particular  
11 component does not result in a top height of the particular component exceeding  
12 the rack height;

13 a single placement constraint which requires that each component be placed  
14 once and only once; and

15 a non-overlapping constraint which requires that each slot in the rack be  
16 occupied by no more than a single component; and

17 evaluating the placement of the components by seeking a minimum height for a  
18 center of gravity of the components.

1 24. (Currently Amended) A computer readable memory comprising computer code for  
2 directing a computer to make a determination of placement of components in a rack, the  
3 determination of the placement of the components comprising the steps of:

4 ~~providing~~obtaining input variables comprising a rack height, an identification of a  
5 set of components, a weight and a height for each component in the set of  
6 components;

7 determining a placement of the components in the rack according to constraints  
8 by solving an optimization problem using the rack height, the identification of the set  
9 of components, the height and weight for each component and the constraints; and

10 evaluating the placement of the components according to ~~an~~at least one objective  
11 comprising at least a center of gravity objective.

1 25. (Previously Presented) The computer readable memory of claim 24 wherein the  
2 constraints comprise:

3 a rack height constraint which requires that placement of a particular component  
4 does not result in a top height of the particular component exceeding the rack height;

5 a single placement constraint which requires that each component be placed once  
6 and only once; and

7 a non-overlapping constraint which requires that each slot in the rack be occupied  
8 by no more than a single component.

1 26. (Previously Presented) The computer readable memory of claim 24 wherein the step  
2 of determining placement of the components according to the constraints finds that at  
3 least one of the constraints cannot be met and further comprising the steps of:

4 relaxing a particular constraint; and

5 determining placement of the components according to remaining constraints.

1 27. (Original) The computer readable memory of claim 26 wherein the step of relaxing  
2 the particular constraint comprises providing a choice of relaxation constraints to a user  
3 and the user selecting the particular constraint from the choice of relaxation constraints.

1 28. (Currently Amended) The computer readable memory of claim 24 further  
2 comprising the step of obtaining ~~a weight~~ and a weight distribution for each component  
3 in the set of components.

1 29. (Currently Amended) The computer readable memory of claim 24[[28]] wherein the  
2 step of evaluating the placement of the components in the rack according to the objective  
3 comprises seeking a minimum height for ~~the~~ a center of gravity.

1 30. (Currently Amended) The computer readable memory of claim 24[[28]] wherein the  
2 step of evaluating the placement of the components in the rack according to the objective  
3 comprises ensuring that a height of the center of gravity does not exceed a selected  
4 height.

1 31. (Original) The computer readable memory of claim 24 wherein the step of  
2 evaluating the placement of the components comprises the step of employing a mixed  
3 integer programming technique.

1 32. (Original) The computer readable memory of claim 31 wherein the step of  
2 employing the mixed integer programming technique employs a heuristic approach.

1 33. (Currently Amended) A computer readable memory comprising computer code for  
2 directing a computer to make a determination of placement of components in a rack, the  
3 determination of the placement of the components comprising the steps of:

4 obtaining a rack height, an identification of a set of components, and, for each  
5 component in the set of components, a height, a weight, and a weight distribution;

6 determining a placement of the components in the rack according to constraints  
7 by solving an optimization problem using the rack height, the identification of the set  
8 of components, the height, weight and weight distribution for each component and the  
9 constraints, wherein the constraints comprise:

10 a rack height constraint which requires that placement of a particular  
11 component does not result in a top height of the particular component exceeding  
12 the rack height;

13 a single placement constraint which requires that each component be  
14 placed once and only once; and

15                   a non-overlapping constraint which requires that each slot in the rack be  
16                   occupied by no more than a single component; and  
17                   evaluating the placement of the components by seeking a minimum height for a  
18                   center of gravity of the components.